

PA Core Standards: Science

Introduction

The 2020–21 school year presents a unique set of opportunities and challenges due to the disruption to instruction in spring 2020 as well as the uncertainty as the school year unfolds. Educators know that every school year there are students who require support in addressing unfinished learning from prior grades; a challenge that will be felt more prominently in the 2020–21 school year. It is vitally important that educators are supported to make deliberate instructional choices that allow all students to effectively engage with grade-level work.

The most effective and equitable way to support students in their learning is to ensure that the vast majority of time is spent engaging with grade-level content and accelerating as needed. It is entirely possible to hold high expectations for all students while addressing unfinished learning in the context of grade-level work. Since time is a scarce commodity in classrooms — made more limited by anticipated closures and remote or hybrid learning models in the fall of 2020 — strategic instructional choices about which content to prioritize must be made.¹

Assessing students at the start of the year will identify learning gaps and provide data to inform instruction. Diagnostic Assessments determine student strengths, weaknesses, knowledge, and skills. Administering diagnostic assessments permits the instructor to intervene at the point where students begin to struggle or when they are performing below grade level expectations (running record, Classroom Diagnostic Tests [CDT]). Diagnostic assessments allow teachers to adjust the curriculum to meet the unique needs of all students. While some concepts have greater emphasis in a particular year, all standards deserve a defined level of instruction. Neglecting concepts may result in learning gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade.

This guidance document is designed to identify and define areas of high-level focus in Science instruction supported by key PA Academic Standards. Note that while all standards deserve a defined level of instruction, neglecting key concepts may result in learning gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade. Not all content in a given grade is emphasized equally in the standards. Some focus areas require greater emphasis than others based on the depth of the ideas, the time taken to master, and/or their importance to the future science grade levels. More time in these areas is also necessary for students to meet the Standards for Inquiry and Design and Unifying Themes.

¹ Adapted from 2020–21 Priority Instructional Content in English Language Arts/literacy and Mathematics, Student Achievement Partners/Achieve the Core. May 2020

GRADE 9 – 12 FOCUS OF INSTRUCTION (2020-2021)

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Focus Areas of Instruction	PA Academic Standards
<p>Life Science</p> <ul style="list-style-type: none"> • Use models to demonstrate how DNA sequences determine the structure and function of proteins. • Create a model to explain, compare and contrast the structure and function of prokaryote and eukaryote cells. • Plan and conduct an investigation to provide evidence and explain the function of positive and negative feedback mechanisms in maintaining homeostasis that is essential for organisms. • Use a model to explain how mitotic cell division results in daughter cells with identical patterns of genetic materials essential for growth and repair of multicellular organisms. • Construct a model to illustrate the similarities and differences between active and passive transport processes. • Use a model to describe the role of cellular division and differentiation to produce and maintain complex organisms composed of organ systems and tissue subsystems that work together to meet the needs of the entire organism. • Use a model to explain the role of cellular division and the mechanisms in meiosis for transmitting genetic information from parents to offspring. • Construct a model to support explanations of the process of photosynthesis by which light energy is converted to stored energy. • Use a model to illustrate how cells use Carbon, Hydrogen, Oxygen, Nitrogen and Sulfur to synthesize biological macromolecules. • Use a model to explain cellular respiration as a chemical process whereby the bonds of food molecules and oxygen molecules are broken and bonds in new compounds are formed that result in a net transfer of energy. • Construct an explanation for how cell differentiation is the result of activation or inactivation of specific genes as well as small differences in the immediate environment of the cells. • Using a model, explain information that inheritable genetic variations may result from (1) genetic combinations in haploid sex cells, (2) errors occurring during replication, (3) crossover between homologous chromosomes during meiosis, and (4) environmental factors. • Use models to explain how the process of natural selection is the result of four factors. • Design solutions for creating or maintaining the sustainability of local ecosystems. 	<p>3.1.10.A <i>Discriminate among the concepts of systems, subsystems, feedback and control in solving technological problems.</i></p> <p>3.1.10.B <i>Describe concepts of models as a way to predict and understand science and technology.</i></p> <p>3.1.12.E <i>Evaluate change in nature, physical systems, and man-made systems.</i></p> <p>3.3.10.A <i>Explain the structural and functional similarities and differences found among living things.</i></p> <p>3.3.10.B <i>Describe and explain the chemical and structural basis of living organisms.</i></p> <p>3.3.10.C <i>Describe how genetic information is inherited and expressed.</i></p> <p>3.3.10.D <i>Explain the mechanisms of the theory of evolution.</i></p> <p>3.4.10.A <i>Explain concepts about the structure and properties of matter.</i></p> <p>3.4.10.B <i>Analyze energy sources and transfers of heat.</i></p> <p>4.6.10.A <i>Explain the biotic and abiotic components of an ecosystem and their interaction.</i></p> <p>4.6.10.B <i>Explain how cycles affect the balance in an ecosystem.</i></p> <p>4.6.10.C <i>Analyze how ecosystems change over time.</i></p> <p>4.7.10.C <i>Identify and explain why adaptations can lead to specialization.</i></p> <p>4.8.10.A <i>Analyze how society's needs relate to the sustainability of natural resources.</i></p> <p>4.8.10.C <i>Analyze how human activities may cause changes in an ecosystem.</i></p> <p>4.8.10.D <i>Explain how the concept of supply and demand affects the environment.</i></p> <p>NOTE: For further direction, review the AA/EC for the Biology Keystone Exam.</p>